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A Self-Help Service Center Management System: Concept Description

by
John H. Williamson

Previous work by the U. S. Army Construction Engineering Research Laboratory (USA-CERL) identified areas of the Army Self-Help (SH) Program that need improvement. Among the most apparent elements lacking in the program is an automated management system for the Self-Help Service Center (SHSC), which handles the training and supplies supporting SH and maintains records of all transactions. Existing methods have resulted in poor management at the SHSC, which creates long delays for the customer and discourages widespread use of the program.

USA-CERL has developed an automated conceptual Self-Help Service Center Management System. The prototype will use MS-DOS and dBase-III-Plus software, and therefore will be compatible with existing hardware at most installations. The system will use bar-code and electronic scanner technology for automatic, efficient completion of daily tasks.

The Fort Devens, MA, Directorate of Engineering and Housing is reviewing the system concept. When the system has been refined and a prototype developed, it will be field-tested at Fort Devens and possibly several other installations during FY88.

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USA-CERL has developed a conceptual Self-Help Service Center Management System. The prototype will use the MS-DOS operating system and dBase-III-Plus software, and therefore will be compatible with existing hardware at most installations. The system will use bar-code and electronic scanner technology for automatic, efficient completion of daily tasks, including: customer authorization; updated display of facility/occupant information; recording of all transactions by item, facility, occupant/unit, and date/time; systematized maintenance of inventory records, and generation of required forms and reports.

The Fort Devens, MA, Directorate of Engineering and Housing is reviewing the system concept. When the system has been refined and a prototype developed, it will be field-tested at Fort Devens and possibly several other installations during FY88.

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FOREWORD

This investigation was performed for the Office of the Chief of Engineers (OCE) under the the project entitled, "Automation of DEH Self-Help Program" as part of the FY87 Facilities Technology Application Test (FTAT) Program. The work was done by the U. S. Army Construction Engineering Research Laboratory (USA-CERL) Facility Systems Division (FS). The OCE Technical Monitor was Helmut Gramberg, DAEN-ZCF-B.

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SELF-HELP SERVICE CENTER MANAGEMENT SYSTEM: CONCEPTUAL DESCRIPTION

1 INTRODUCTION

Background

Goals of the Army's Self-Help (SH) Program are to improve the quality of its facilities, save money, and create a sense of pride among occupants. The program provides family housing occupants with training and supplies that allow them to do their own simple repairs and upkeep. Effective implementation of SH protects the Army's resources in two ways: (1) maintenance and repair (M&R) costs are reduced because a percentage of this work does not have to be performed by Directorate of Engineering and Housing (DEH) personnel or contracted to private companies and (2) occupants' level of satisfaction is boosted by improving their facilities.

The General Accounting Office (GAO) has questioned the current structure of the SH Program, calling it outdated, inefficient, and ineffective. As a result, it was determined that the program should be studied in depth. In addition, the Department of Defense has called for improvements to the program as part of its recent emphasis on methods of enhancing morale.

In response to this situation, the U. S. Army Construction Engineering Research Laboratory (USA-CERL) has been studying the SH Program to identify areas contributing to a low success rate and to recommend corrective measures.¹ An evaluation of past records revealed that only a small percentage of eligible residents (i.e., the "customers") have been participating in the program--a situation having dramatic impact on the program's effectiveness in terms of both cost savings and benefit to occupants.

An efficient installation SH Program must provide good customer service to encourage participation. The previous research by USA-CERL identified problems in current operations that may deter customers from using the program. A survey of customers showed that a serious drawback is the length of time required to check in and out of the Self-Help Service Center (SHSC), which handles the training and materials supporting the program. The delays in customer service result primarily from a poorly developed management system that maintains inaccurate records and creates confusion in tracking transactions.

To improve the operation and management of the SH Program, installation SHSCs need an automated system for authorization, inventory control, and over-the-counter transactions. An effective automated system will help managers prevent abuses of the program, predict inventory requirements, and evaluate operational hours and cost effectiveness. Such a system must be: configured to existing microcomputer hardware at

¹J. H. Williamson, C. E. DeLong, C. Norris, and S. Glaeser, *Family Housing Self-Help Program: Evaluation and Recommendations for Improvements*, Technical Report P-86/08/ADA171466 (U. S. Army Construction Engineering Research Laboratory [USA-CERL], 1986); J. H. Williamson, M. M. Blyth, and R. T. Eicken, *Evaluation of Recommended Improvements to the Family Housing Self-Help Program*, Technical Report P-87/14/ADA190375 (USA-CERL, 1987).

most installations, integrated with minimal disruption of ongoing work, and easy to operate without requiring expertise in computer operations. In addition, it must be flexible so that it can be adapted to the various types of SH Programs functioning at different installations.

Purpose

The Purpose of this study was to develop a conceptual Self-Help Service Center Management System to support SHSC activities for installation Directorates of Engineering and Housing.

Approach

In the previous studies by USA-CERL, current operations of Army SH Programs were analyzed for effectiveness and acceptability among the users. Program managers were interviewed to determine their operational needs. Using this information, the concept for the SHSC Management System was developed and modified based on a review by SHSC managers. The approved concept forms the basis for a prototype computer program being developed by a contractor. The prototype will use MS-DOS and dBase-III-Plus software, and will be configured for use on systems already online at most installations. The prototype will be field-tested at Fort Devens, MA, during FY88.

Mode of Technology Transfer

When the system has been refined, field-tested, and proven successful, the technology will be transferred to installation DEHs through the distribution of software and its documentation, including special instructions for any unique requirements. System installation and maintenance will be supported by appropriate instructional materials, training programs, and support groups.

2 ANALYSIS OF SYSTEM REQUIREMENTS

Overview

The SHSC automated system should allow operational and managerial personnel to control and monitor SHSC activities on a regular basis and to generate necessary forms, analyses, and reports. Functions should include inventory control, issue-tracking, report generation, and historical recordkeeping.

The general requirements of such a program were stated as:

1. Identification and validation of SHSC customers using bar-coded authorization cards issued by the SHSC.
2. Automatic display of facility/occupant information.
3. Automation of service counter daily operations using bar-code technology to record transactions by inventory item, facility, and occupant, with time and date of transactions.
4. Maintenance of inventory records, including quantity on hand, reorder point, source, and identification of direct-exchange (DX) items.
5. Automatic generation of forms and reports such as the DD Form 1150 for consumable item issues, tool loan receipts, daily reports of overdue loans, supply requests, purchase orders, and various management and briefing reports.

Basic Relationships

Figures 1* and 2 show the basic functions, relationships, and objectives of the SHSC Management System. Figure 1 reflects the two-fold (operations and management) nature of the system as well as the overall input/output (I/O) relationships of the system. Most input will be done using bar codes, with some manual input required of the program manager and/or service desk personnel. The system data base will be updated continually through the course of day-to-day SH transactions and operations. Finally, the system will automatically generate reports such as periodic physical inventories and required management and briefing reports.

Figure 2 illustrates in more detail the interactions and practical relationships within the SHSC Management System. Once again, the two-fold nature of the system is apparent. Following is a brief description of each system element shown in this figure.

Data Base

The data base is the central element of the system; all input and output will either effect a change or be affected by a change in the data base. Both customer service and management functions will impact the data base and therefore each other. Stored in this data base will be inventory, historical records, and occupant/user authorization information.

*Figures for this chapter begin on p 11.

Customer Service Functions

All customer service functions will be processed at the service desk. These functions usually will affect the inventory and other elements in the data base. The manager also will be able to modify the data base while bypassing the various service desk functions.

All SH participants will be issued a bar-coded ID card upon completion of any required SH training or during in-processing. This card will authorize the person to use the SH Program and will be used to start all SH transactions. The IDs will be read by a light pen and will allow instant access to individual histories, thus helping to prevent program abuse.

The SHSC manager will record materials and equipment to be issued using a bar-coded inventory index which is scanned by a light pen during the transactions. As issues and returns are made at the service desk, all inventories, histories, and system data will be updated automatically.

Every transaction will be accompanied by an automatically generated DD Form 1150 or hand receipt which is given to the customer. This system will eliminate the need for the SHSC to keep a hard copy receipt for every transaction, except for permanent or temporary tool loans.

Management Functions

Inventory control is the central element of program management since almost all functions are related to the inventory. All transactions, issues, returns, and restocking will automatically update a perpetual inventory system. The system will generate purchase orders, supply requests, and inventory reports.

The system will maintain transaction files for all types of issues. Information on amounts, times, and types of issues will help monitor and improve program operation and efficiency as well as aid in inventory control.

Specific management and briefing reports will be generated by the system upon request. The program manager will have complete access to the data base and other functions to make necessary input, adjustments, and updates.

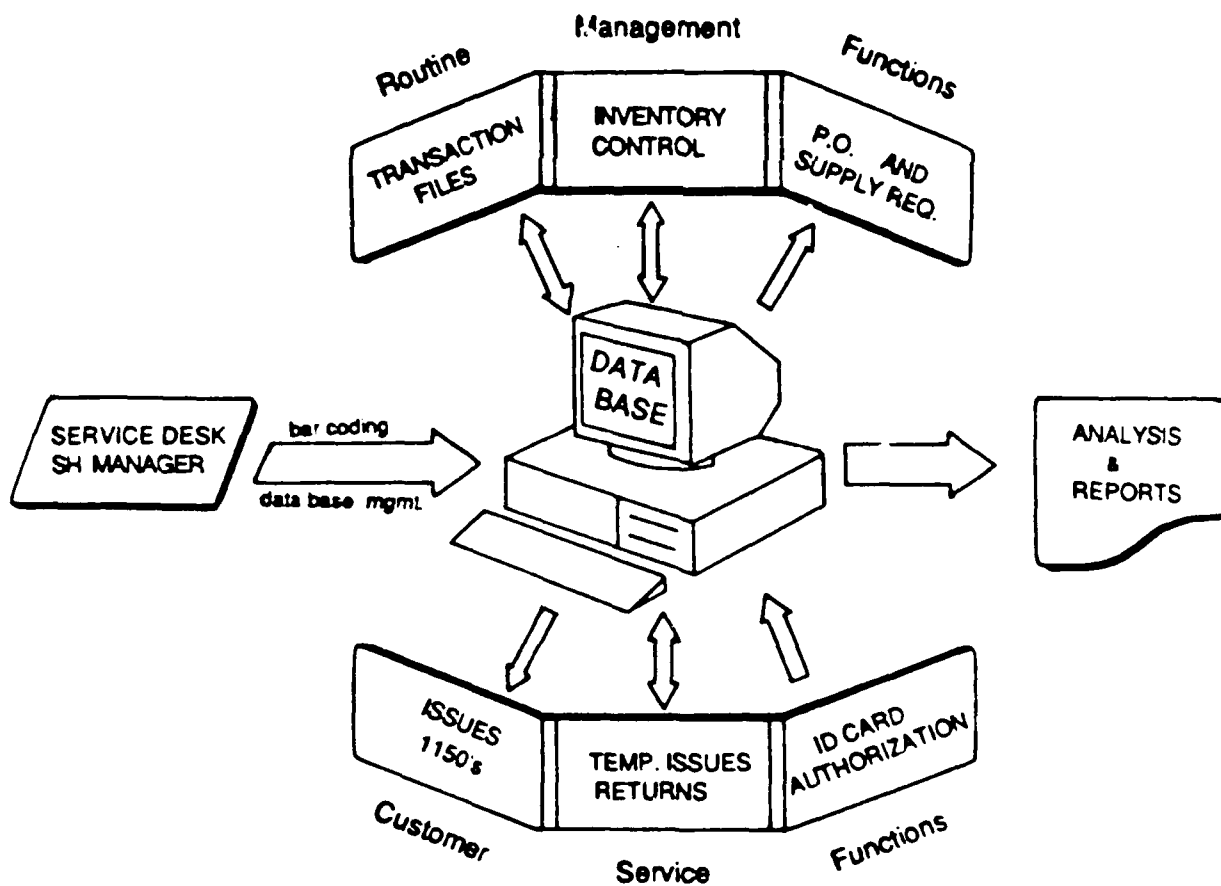


Figure 1. SHSC Management System general relationships.

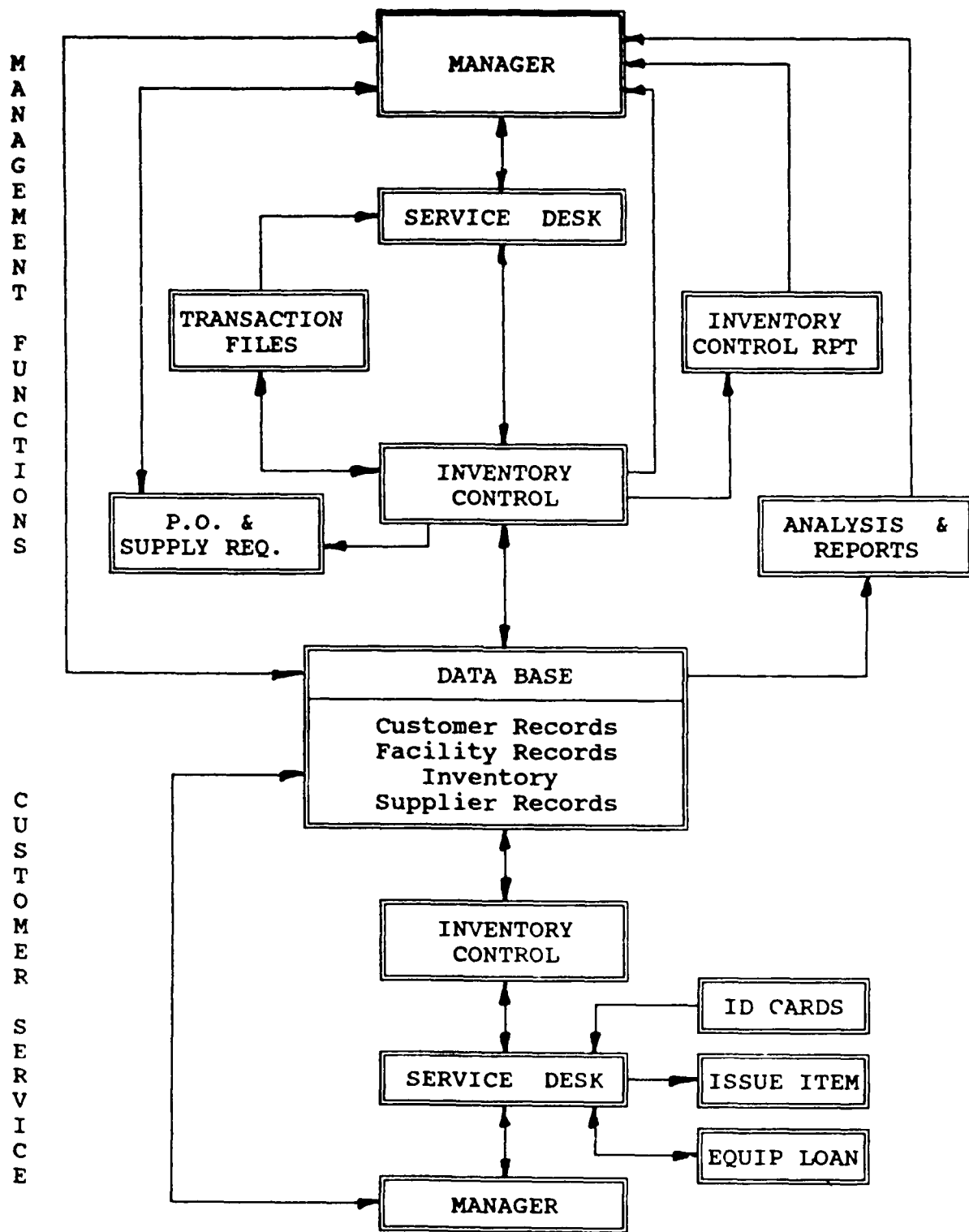


Figure 2. SHSC Management System interactions and practical relationships.

3 SYSTEM OPERATION

The Basic User/System Interaction

The SHSC Management System is being developed to provide the greatest flexibility in support of SH management at Army installations. Program capabilities can be divided into five categories: (1) authorization, (2) automated service desk operations, (3) inventory control, (4) unit/occupant histories and inventories, and (5) administrative tasks.

The functional and data base requirements for implementing the SHSC Management System are within the capabilities of the commercially available microcomputer hardware and software already online at most installations. Hardware requirements can be met by the IBM PC AT or compatible microcomputer and a dot matrix printer. The system requires no data base support procedures significantly different from currently available commercial software.

The data base and bar-code technology will already be set up to handle the authorization, desk operation, inventory control, and administrative tasks. However, the information necessary to track unit and occupant histories and inventories must be accumulated over time. This buildup will occur naturally with day-to-day transactions, transition of occupants and users, and ongoing renovation of facilities.

A typical transaction at the SHSC will take place as follows using the SHSC Management System:

1. The customer presents his/her ID card. The bar code on it is read by a light pen scan and the computer automatically displays the customer's history on the terminal screen. The manager reviews the display and, if there are no problems, authorizes the use of the SHSC.
2. Desk personnel then look up the requested item in a book at the service desk which lists all items with their corresponding bar code. Using the bar-code reader, the request is entered into the system which checks whether the item is authorized, available, and, if applicable, does not violate the customer's limit on consumables.
3. The item is retrieved from the warehouse and the appropriate quantity of each item is entered into the computer. The system automatically generates a Form 1150 or hand receipt and updates the inventory, transaction, and customer history data.
4. When returnable items are checked back in, all information is once again updated automatically with the light pen used to make the entries.

To begin a transaction on the SHSC Management System, the user logs on by entering an operator ID. Figure 3* shows the opening screen menu and lists the options available. An option is selected from the Main Menu by using the up/down arrow keys to highlight the desired option, and then pressing <RETURN>. This procedure is standard throughout the program. Pressing <Esc> will allow the user to recover from an error and return to the menu for the correct selection.

*The table and figures for this chapter begin on p 17.

Issue/Return Transactions

This option is the most commonly used on a daily basis for customer service. Choosing this option will display a data entry screen (Figure 4) for over-the-counter transactions. The user will first be prompted to identify the customer by scanning the bar code on the ID card. An automatic message will appear if this customer has overdue borrowed items. Choosing "List Overdues" or "List Outstanding" will display the returnable items already issued to this customer.

To conduct a transaction, the clerk first scans the bar code for the requested items on the store inventory list to automatically enter the "Catalog #" and "Description." Entering "C", "T", or "P" will indicate to the program whether this transaction is for a Consumable, Temporary loan, or Permanent loan item, respectively. Entering "I" or "R" will indicate whether an item is to be Issued or is being Returned. In the case of a temporary loan, the "Due Date and Time" will be displayed automatically. Upon completing the entry of all requested items, choosing the "Close Transaction" option at the top of the screen will automatically generate a Form 1150 for consumable items or a hand receipt for all loaned items, including currently outstanding loans, as appropriate. The inventory, customer history, and housing unit history files will be updated automatically.

The remaining options on the Main Menu, while used less often than the Issue/Return option, provide additional operational and management capabilities and are briefly described below.

Equipment Repair

When equipment and tools must be repaired, this option allows the SHSC manager to modify the inventory and to keep track of the items being repaired. Choosing this option presents the screen shown in Figure 5, which allows the user to either "Mark the Tool for Repair" and therefore remove it from the available inventory or to place it back into service with the "Receive Repaired Tool" option.

Choosing either the "Mark Tool for Repair" or "Receive Repaired Tool" option will present the screen shown in Figure 6. The user can either scan the bar code or type in the catalog number for the item. The description will be displayed automatically so that the user can confirm the catalog number. If appropriate, the user can type in the serial number of the particular piece of equipment to identify which unit is being repaired or returned. The item is then automatically removed or placed back in service, as appropriate.

Add/Remove Suppliers

The system will keep track of the source of items carried in the inventory. Choosing the "Add/Remove Suppliers" option from the Main Menu allows the user to modify previously entered supplier information (name, address, telephone number, etc.) or to add or delete supplier information for any item in the inventory. Figure 7 shows the menu for modifying supplier information.

Choosing the "Edit/Review Supplier," "Add Supplier," or "Delete Supplier" option will present the screen shown in Figure 8. The user can either scan the bar code or type in the identification number for the supplier. If a supplier exists for that number, the

rest of the information will be displayed automatically for editing or deleting. If a new identification number is entered, these fields will remain blank until the operator enters the information. The identification number is matched with the inventory items obtained from that supplier so that, when reordering is necessary, the system will prompt the user for the purchase source.

Edit Inventory

This option allows the user to modify the inventory data base. This function includes changing any of the attributes of an item and adding/deleting items. Figure 9 shows the menu for this option. Data entry will be onto a screen that displays all of the item's attributes and allows the user to freely change or enter any desired information.

Choosing the "Edit/Revise Item," "Add Item," or "Delete Item" option from the Inventory Menu will result in a prompt to type or scan a self-help catalog number. The system will display all information about that item as shown in Figure 10. The user can then enter the remaining information or, if the item is already in the inventory, review or revise as desired. Table 1 explains the data fields shown in Figure 10.

"Default Days of Loan" and "Default Hours of Loan" set the normal period during which a tool can be borrowed and are used to automatically compute the return date/time on the issue/return transaction form (see Figure 4). This value can be overridden by the SHSC manager at the time of issue.

After entering/editing this data, the user presses the "F10" key to accept the information and update the program or presses "F2" to disregard the changes in case of error and to start over.

Edit Customers

This program maintains information about SHSC authorized customers, including ID number, name, rank, housing assignment (date assigned and expected termination), telephone number, etc. The SHSC manager can change any of this information using the "Edit Customers" option. Figure 11 shows the menu for this capability. Again, data entry will be onto a screen that displays and permits changes to all of the information.

Choosing the "Edit/Revise Customer," "Add Customer," or "Delete Customer" option from the Customer Edit Menu will result in a prompt to type or scan an SH customer identification number. The system will then display all information about the customer as shown in Figure 12. The user can then enter the remaining information or, if the customer is already in the system, review or revise as desired.

After entering/editing these data, the user presses the "F10" key, which triggers the system to accept the information and update the program. Pressing "F2" instructs the system to disregard the changes (e.g., due to an error) and to start over.

Edit Housing Unit Descriptions

The system will offer the option of maintaining inventories of the appliances and fixtures for which repair/replacement parts are most commonly requested through SHSC. Collecting the information and entering it into the system will take time but,

once done, the SHSC clerk will be better able to help customers select the correct repair parts by using the "List Unit" option on the transaction form (Figure 4) to look up the brand and model number of the appliance or fixture. For example, if a customer needs a furnace filter, a simple check will tell the clerk which size filter is required. Figure 13 shows the menu for modifying the housing unit description.

Choosing the "Edit/Revise Unit," "Add Unit," or "Delete Unit" option from the Housing Unit Menu will result in a prompt to enter a housing unit number. The system will then display all information about the housing unit as shown in Figure 14. The user can enter the remaining information or, if that housing unit is already in the system, review or revise as necessary. HOUSING UNIT TYPE refers to troop or family housing; HOUSING UNIT CATEGORY is a user-defined entry such as "Cherokee Village" or "4th Battalion," etc. The additional information on the main portion of the screen is for specific brand/model/size/color of equipment, floor/wall coverings, etc.

After entering/editing these data, the user presses the "F10" key to indicate that the system should accept the information and update the program, or "F2" for the system to disregard the changes in case of error and start over.

Reports Generation

Several standard reports will be available upon the user's request. Other reports can be added if a special requirement is identified. Figure 15 shows the menu for generating standard reports. All reports can be displayed on the screen, sent to a printer, or both.

The "Individual Equipment Issues" option lists the demand for tools and equipment in the inventory and helps the SHSC manager determine the most effective balance of items. For example, items seldom requested may be eliminated from the inventory in favor of a larger number of items in high demand. Issues to individual customers are also available. Similarly, consumable item issue histories can be displayed by item or by customer for any specified time period. A complete list of overdue loaned equipment can be generated, along with telephone numbers of responsible customers.

Optimal use of the SHSC is important to the program's success and therefore the center should be open during times when records show the highest number of customers. A standard report is available to help the SHSC manager set operating days and hours that have proven to be the most productive in terms of numbers of customers.

Inventory checksheets for any item in the stockroom are available on demand to allow physical verification of calculated inventory levels. The SHSC manager can use the Edit Inventory option to establish desirable inventory levels and reorder thresholds. Upon request, the system will issue a report of items to be reordered with the quantity and source of each.

Self-Help Service Center Management System

MAIN MENU
Issue/Return
Equipment Repair
Equipment/Tool Reorder
Add/Remove Supplier
Edit Inventory
Edit Housing Unit
Reports
Quit System to DOS

Figure 3. Main menu.

Close Transaction	List Overdues	List Outstanding	List Unit
Customer ID Number :		Today's Date : 08/26/87	
Last Name :			
First Name :			
-----		-----Due-----	
Catalog #	Description	C/T/P I/R	Qty Date Time
-----		-----	

Figure 4. Data entry screen for over-the-counter transactions.

Self-Help Service Center Management System

REPAIR MENU
Return to Main Menu
Mark Tool for Repair
Receive Repaired Tool

Figure 5. Repair menu.

Self-Help Service Center Management System

Catalog # :	
Serial # :	

Type or SCAN Catalog #
Type Serial # if applicable
<Esc> - Repair Menu

Figure 6. Data entry screen for removing or returning a repair item.

Self-Help Service Center Management System

SUPPLIER MENU
Return to Main Menu
Edit/Review Supplier
Add Supplier
Delete Supplier

Figure 7. Supplier menu.

Self-Help Service Center Management System

Supplier # :	
Name:	
Address:	
Contact:	
Telephone:	

Type or SCAN Supplier #
<Esc> - Supplier Menu

Figure 8. Data entry screen for changing supplier information.

Self-Help Service Center Management System	
INVENTORY MENU	
Return to Main Menu	
Edit/Revise Item	
Add Item	
Delete Item	

Figure 9. Inventory menu.

SH Catalog #: <input style="width: 150px;" type="text"/>		Type: <input style="width: 50px;" type="text"/>	
Stock #: <input style="width: 150px;" type="text"/>		Authorization: <input style="width: 50px;" type="text"/>	
Description: <input style="width: 450px;" type="text"/>			
Location:	Aisle: <input style="width: 40px;" type="text"/>	Row: <input style="width: 40px;" type="text"/>	Bin: <input style="width: 40px;" type="text"/>
Supplier ID: <input style="width: 40px;" type="text"/>	Last Cost: \$ <input style="width: 100px;" type="text"/>		
Available: <input style="width: 40px;" type="text"/>	On Loan: <input style="width: 40px;" type="text"/>	Inoperative: <input style="width: 40px;" type="text"/>	
On Order : <input style="width: 40px;" type="text"/>	Default Days of Loan: <input style="width: 40px;" type="text"/>		
	Default Hours of Loan: <input style="width: 40px;" type="text"/>		
F2 - Discard Changes		F10 - Accept Changes	

Figure 10. Data entry fields in the activated Edit Inventory option.

Table 1

Explanation of Data Fields on the Inventory Entry Screen

Data Field	User's Entry
"Type"	<u>C</u> onsumable, <u>T</u> emporary loan, or <u>P</u> ermanent loan
"Stock #"	Federal stock number or other identifying number
"Authorization"	Family Housing, Troop Housing, or both
"Description"	Plain language description of item
"Location"	Where located in stockroom
"Supplier ID"	Source of this item
"Last Cost"	Cost of this item when last purchased--used as basis of computing charges to family housing or O&M accounts
"Available"	Number on hand for issue or loan
"On Loan"	Number currently on loan (tools)
"Inoperative"	Number not available for loan (tools)
"On Order"	Number ordered but not received

<p align="center">Self-Help Service Center Management System</p> <table border="1"> <tr> <td align="center">CUSTOMER MENU</td> </tr> <tr> <td> Return to Main Menu Edit/Revise Customer Add Customer Delete Customer </td> </tr> </table>	CUSTOMER MENU	Return to Main Menu Edit/Revise Customer Add Customer Delete Customer
CUSTOMER MENU		
Return to Main Menu Edit/Revise Customer Add Customer Delete Customer		

Figure 11. Edit Customer menu.

SH ID #: <input type="text"/>			
Responsible Person:			
Last <input type="text"/>	First <input type="text"/>	MI <input type="text"/>	Rank <input type="text"/>
Other Authorized Person:			
Last <input type="text"/>	First <input type="text"/>	MI <input type="text"/>	Rank <input type="text"/>
Housing Unit Number: <input type="text"/>		Date Assigned <input type="text"/> / <input type="text"/> / <input type="text"/>	
		Expected Termination Date <input type="text"/> / <input type="text"/> / <input type="text"/>	
Duty Phone <input type="text"/>		Home Phone <input type="text"/>	
F2 - Discard Changes		F10 - Accept Changes	

Figure 12. Data entry screen for the activated Edit Customer option.

Self-Help Service Center Management System

HOUSING UNIT MENU

Return to Main Menu
Edit/Revise Unit
Add Unit
Delete Unit

Figure 13. Edit Housing Unit menu.

HOUSING UNIT #:
HOUSING UNIT TYPE:

HOUSING UNIT CATEGORY:

HOUSING UNIT INVENTORY

Furnace Hot Water Heater Air Conditioner Range Range Hood Dishwasher Refrigerator Kitchen Faucet Kitchen Cabinets Lavatory Faucet	Bath Faucet Water Closet Shower Wall Finish Ventilating Fans Electrical Panel Window Shades Window Screens Floor Coverings Other Other
--	---

F2 - Discard Changes
F10 - Accept Changes

Figure 14. Data entry screen for the activated Edit Housing Unit option.

Self-Help Service Center Management System

REPORT MENU
Return to Main Menu
Individual Equipment Issues
Consumable Usage History
Overdue Equipment
Self-Help Store Utilization
Inventory Check Sheets
Reorder Requirements

Figure 15. Reports Generation menu.

5 CONCLUSION

A conceptual SHSC Management System has been described. This system will improve operation and management of the SH Program at Army installations by automating many of the tasks now done manually. The increased speed and accuracy with which customer transactions can be handled will raise customers' satisfaction with the program, allow managers to control the inventory, prevent abuses of SH, and ensure that business hours at the SHSC are compatible with peak usage times. Improvements due to this system as well as the others recommended in previous USA-CERL studies should result in the optimal participation needed to gain the greatest possible economic and psychological benefits from the program.

The prototype system will use MS-DOS and dBase-III-Plus software. It will require an IBM PC AT or compatible and a dot matrix printer. As envisioned, the system will be easily configured to microcomputer hardware already online at most installations, and will need no special data base support procedures. This management system will use bar-code and electronic pencil scanner technology for quick, accurate updates to the data base and easy location of SH supplies. Bar codes also will appear on the user ID cards for automatic authorization.

The system operating concept has been described along with the various menus and their capabilities. SHSC managers should be able to learn the system quickly with minimal training. With proper use, this system will improve management efficiency while providing better customer service.

Development of the SHSC Management System is being coordinated closely with potential users to ensure its responsiveness to their needs. The Fort Devens, MA, DEH has reviewed the concept and recommended modifications and enhancements. When all reviewer input has been addressed and a prototype is completed, Fort Devens and possibly some other installations will field-test it in an actual use situation at the SHSC. After this testing, the system will be further enhanced and made available for general release, probably during the second quarter of FY88.

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